Regency® COMMUNICATIONS, INC.

SERVICE MANUAL

UHF POWER AMPLIFIER

MODEL BAU-8035

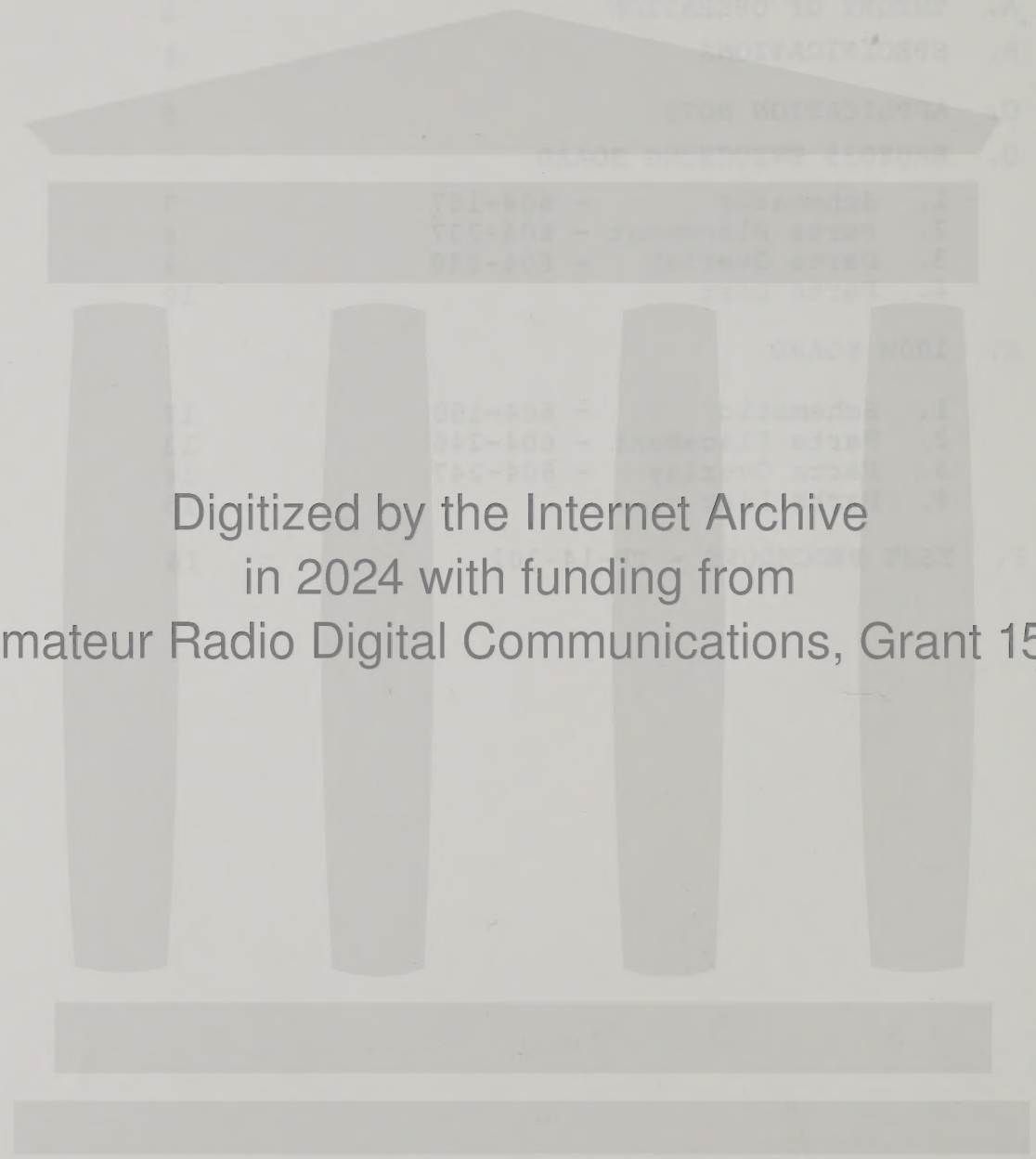
1227 S. PATRICK DRIVE
SATELLITE BEACH, FL.

0300-4244-600

PRINTED IN USA
8/81

INDEX

		PAGE
A.	THEORY OF OPERATION	1
B.	SPECIFICATIONS	4
C.	APPLICATION NOTE	5
D.	BAU8035 SWITCHING BOARD	
	1. Schematic - 604-167	7
	2. Parts Placement - 604-237	8
	3. Parts Overlay - 604-238	9
	4. Parts List	10
E.	100W BOARD	
	1. Schematic - 604-150	12
	2. Parts Placement - 604-246	13
	3. Parts Overlay - 604-247	14
	4. Parts List	15
F.	TEST PROCEDURE - TP-14-302	16



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BAU 8035 SERIES

The BAU 8035 series UHF power amplifier is designed to be used with MCU 30 series transceivers. It performs both as a power amplifier and as an antenna switch. Model BAU 8035A, in the 450 - 476 MHz range, is used with the MCU31/34 transceiver and model BAU 8035B, in the 470 - 512 MHz range, is used with the MCU31H/34H transceiver. The amplifier requires 35W of input power for a 80W rating.

The antenna switch is made up of pin diodes CR105, 107, 108, 109 and their bias circuitry. In the receive mode, diodes CR105 and CR108 are biased on, CR107 and CR109 are biased off. The BAU 8035 then has a low insertion loss between its input and output ports. Relay RY101 switches the DC voltages applied to the diode bias network. Diodes CR105 and CR108 are on whenever 13.6 VDC is plugged into the amplifier and draw 100ma max.

A bidirectional coupler circuit followed by an amplifier switching circuit causes the relays to switch between the transmit and receive modes. The operational amplifier, IC101, is normally biased in the receive mode by R104, R105 and R108. When the bidirectional coupler senses sufficient RF power in the forward direction, CR101 causes the voltage at Pin 2 of IC101 to rise enough to switch the IC101 output to the transmit mode. However, if the coupler senses sufficient reflected RF power indicating a poor output VSWR CR102 causes the voltage at Pin 3 of IC101 also to rise and the amplifier output remains in the receive mode. This protects the amplifier transistors by not switching in the amplifier if an output mismatch of approximately 3:1 or greater is sensed.

The output of IC101 drives Q101 which in turn drives relays RY101 and RY201 and the transmitter indicator CR302. The antenna switch, controlled by RY101 and RY201, switches 13.6 VDC to the power transistors, Q201 and Q202. The output of IC101 also drives Q102, Q103 and the ON/SWR (receiver mode) indicator, CR301. The transmitter indicator is on only when the transceiver is keyed and a good antenna match is sensed. The On/SWR indicator is on when the ON/OFF switch is turned on or when an output mismatch greater than 3:1 is sensed when the transceiver is keyed.

The power amplifier, consisting of Q201 and Q202 operating in parallel, requires an input power of 35W. To tune the BAU 8035 the following procedure should be followed. The BAU 8035 should be connected to a MCU 30 transceiver with watt meters on both the input and output.

1. Tie TP1 to 13.6 VDC and thus force the BAU 8035 in the transmit mode.
2. Key the transceiver and tune C202, C222 and C223 for minimum input reflected power.
3. Tune C211 for maximum output power.
4. Remove the jumper on TP1. Verify that the mobile transceiver sensitivity has not been degraded beyond the sum of the 1.5dB maximum rating of the BAU 8035 and the cable losses.

5. Key the mobile transceiver. The red transmit indicator should light and the output wattmeter should read over 80W. Monitor the DC voltages across R202 and R203. If the voltages are not within 0.1 VDC of each other, tune C202, C222, C223 and C211. If either exceeds 0.45 VDC tune C211 so 0.45 VDC is not exceeded.

6. When operating under rules restricting output power to 110W, tune C211 toward maximum capacitance for best amplifier efficiency so 110W is not exceeded.

7. Similarly in applications restricted to 75W, tune C211 toward maximum capacitance for best amplifier efficiency so that 75W is not exceeded.

WARNING: If no DC power is plugged into the BAU8035 and 35W is applied to the input, the pin diodes will be damaged. Also, if more than 60W is applied to the input of the BAU8035, the diodes may be damaged. In the receive mode, if no DC power is plugged into the BAU8035 excessive receiver loss through the BAU8035 will result (greater than 10dB).

SPECIFICATIONS

Frequency Range	450 - 512 MHz 2 Bands
Operating Temp	-30°C to +60°C
Size (W-D-H)	10" x 5½" x 3½" rack mounted
Weight	5.0 lbs.
Power	13.6 VDC
Current drain	@ 13.6 VDC
Receive Off	100ma max
Receive On	150ma max
Transmit	20A max
Antenna	50 ohms

TRANSMITTER

Pwr Output with input power 35W min. @ EIA intermittent	80W
DC power into final	160W
Spur & harm conducted	-63dB max
Spur & harm radiated	-63dB max
Operating bandwidth	±5 MHz
Trans carrier attack	EIA 100ms max
Maximum input power	60W

APPLICATION NOTE: INSTALLATION OF BAU8035

The length and type of cables used in the installation of the BAU8035 will cause differences in the output power delivered to the antenna. The cables to be considered are the DC power cable between the BAU8035 and the battery and the RF power cables between the input of the BAU8035 and the mobile radio and between the BAU8035 output and the antenna.

A typical curve of BAU8035 output power versus input power delivered to the BAU8035 and versus the DC voltage measured at the BAU8035 DC input terminals is shown in Figure 1. From this data some conclusions can be drawn for best performance out of the mobile radio, BAU8035, and antenna combination.

1. The DC power cable conductor size should be at least 14AWG and the length should be as short as possible.

   To illustrate, consider a BAU8035 drawing 14A with 14AWG cable to the battery ten feet away. Calculate the voltage drop between the BAU8035 and the battery.

   $$V = 0.00282 \text{ ohms/ft} * 20 \text{ ft} \times 14 \text{ A} = 0.8 \text{ VDC}$$

2. The RF cable between the radio and the BAU8035 should be as short as possible and the cable-type should be considered on its insertion loss. Table 1 compares BAU8035 output power to input cable-type assuming ten feet of cable between the radio and the BAU8035.

TABLE 1 - TYPICAL BAU8035 OUTPUT POWER
USING TEN FEET OF DIFFERENT CABLES AT 13.6VDC

Radio Output Power	Cable Type	Insertion Loss	Power Into BAU	Power Out of BAU
50W	-	0	50W	105W
50	RG- 8A/U	0.5dB	45	95
50	RG-58A/U	1.0dB	40	86
40	-	0	40	86
40	RG- 8A/U	0.5	36	76
40	RG-58A/U	1.0	32	68
35	-	0	35	75
35	RG- 8A/U	0.5	31	67
35	RG-58A/U	1.0	28	59

3. The RF cable to the antenna should be as short as possible. Typical antenna cable, RG-58A/U, exhibits 0.1dB insertion loss per foot which translates to a loss of 2W per foot at the 80W power level.

THE RF CABLE TO THE ANTENNA SHOULD BE AS SHORT AS POSSIBLE. TYPICAL ANTENNA CABLE, RG-58 A/U, EXHIBITS 0.1dB INSERTION LOSS PER FOOT WHICH TRANSLATES TO A LOSS OF 2W PER FOOT AT THE 80 W POWER LEVEL.

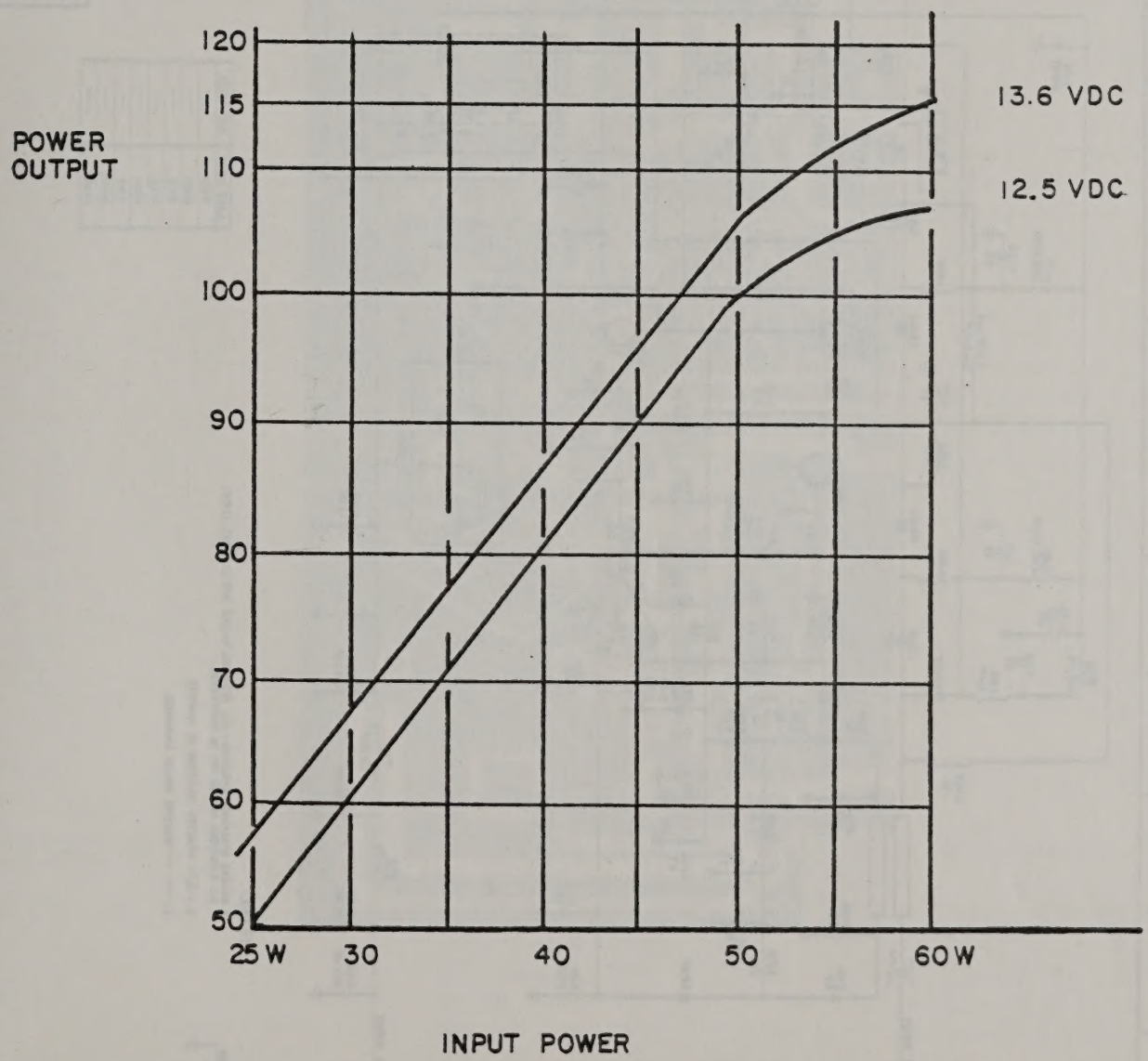
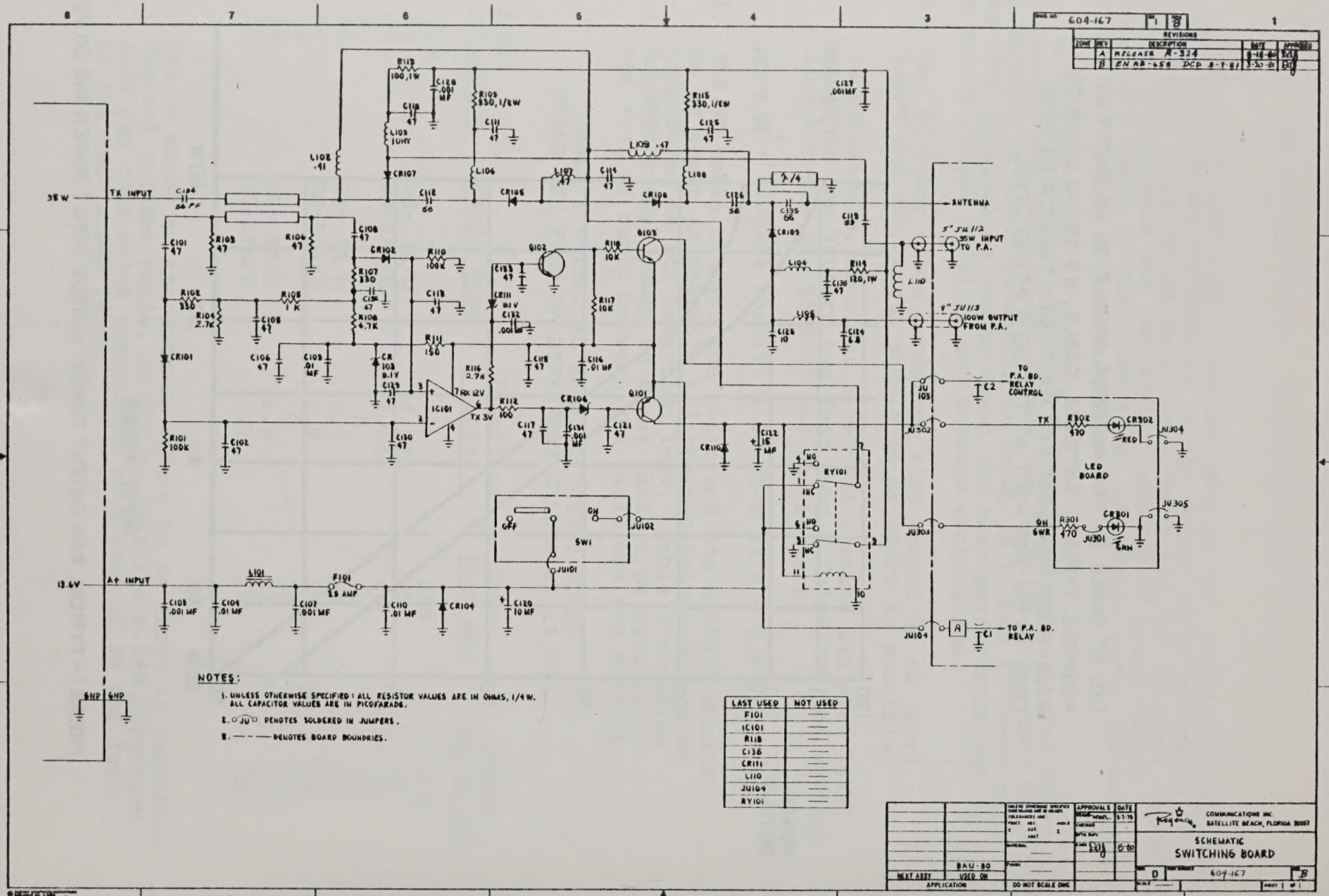
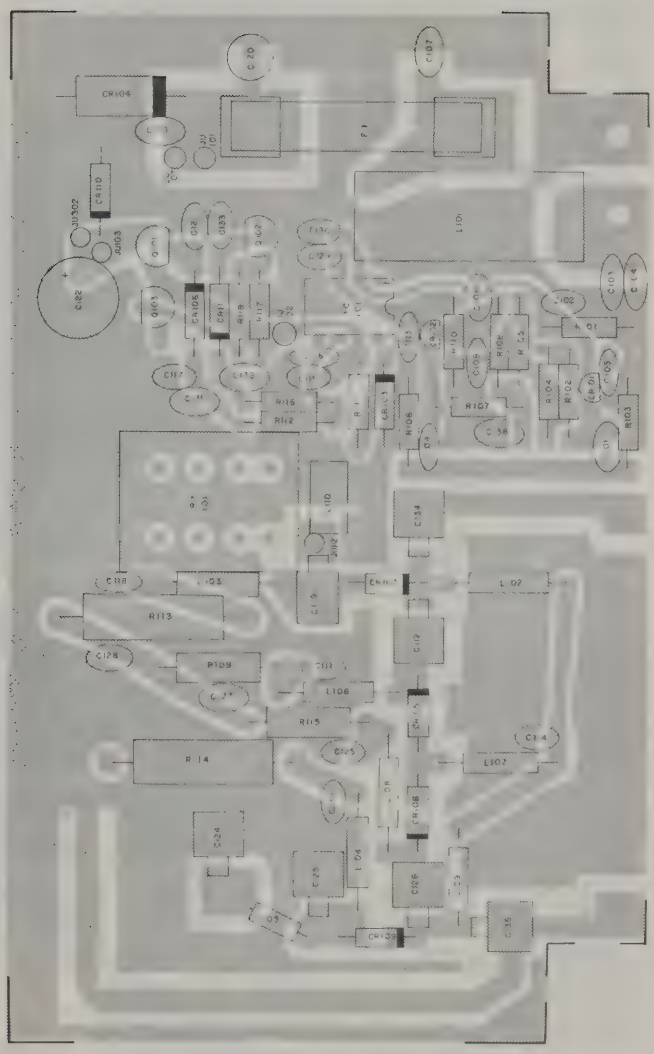
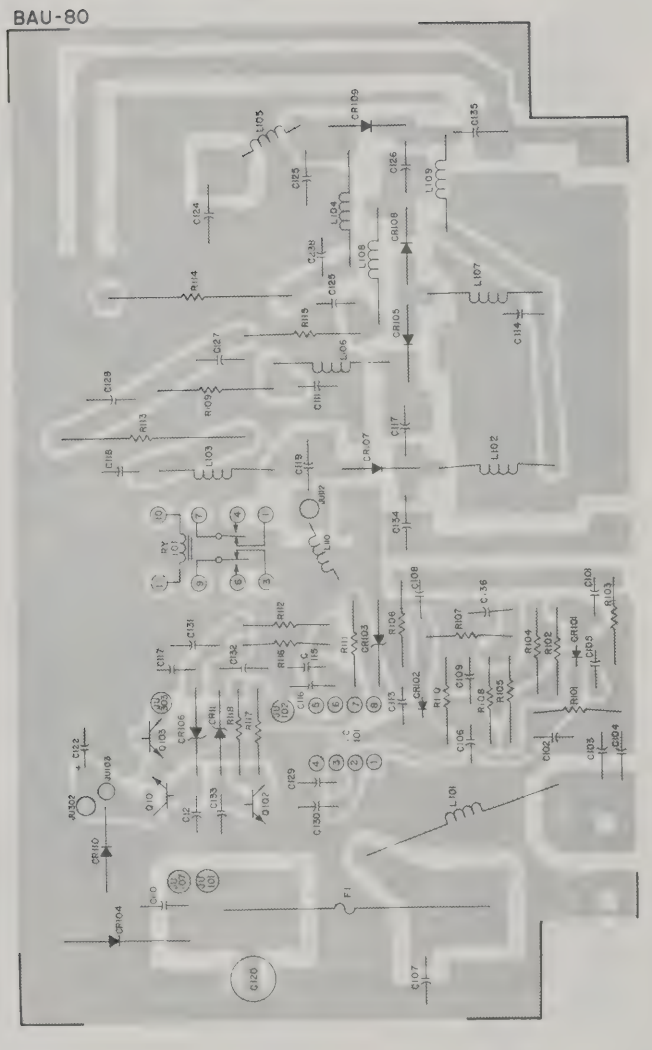


FIGURE 1 - TYPICAL BAU OUTPUT POWER VERSUS INPUT POWER AND DC VOLTAGE


604-167
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
A RELEASE A-324 8-16-80
B EN AB-458 DCP 8-7-81 9-30-81
35 W
TX INPUT
C124 56 PF
ANTENNA
λ/4
5" JU112 35W INPUT TO P.A.
9" JU113 100W OUTPUT FROM P.A.
L110
R114 120, 1W
C138 47
C128 10
C124 6.8
C135 56
C119 33
CR105
L102 .41
L103 1UHY
L104
L105
L106
L107 .47
L108
L109 .47
R113 100, 1W
C120 .001 MF
R109 330, 1/2W
C111 47
R115 330, 1/2W
C125 47
C127 .001MF
CR107
CR106
CR108
C112 56
C114 47
C126 56
C101 47
R103 47
R104 47
C108 47
CR102
R107 330
R108 4.7K
R110 100K
C113 47
C136 47
R102 330
R105 1K
R104 2.7K
C108 47
Q102
Q103
R118 10K
R117 10K
C133 47
CR111 18V
C132 .001 MF
R111 150
CR101
C106 47
C103 .01 MF
CR 103 8.1V
C129 47
R116 2.7K
C115 47
C116 .01 MF
IC101
RX 12V
TX 3V
R112 100
CR104
Q101
C117 47
C134 .001 MF
C121 47
R101 100K
C102 47
C130 47
CR110
C122 15 MF
RY101
NO
NC
COM
SW1
OFF
ON
JU102
JU101
JU103
C2
TO P.A. BD. RELAY CONTROL
JU302
TX
R302 470
CR302 RED
JU304
LED BOARD
JU303
ON 6WR
R301 470
CR301 GRN
JU301
JU305
13.6V
A+ INPUT
L101
F101 1.5 AMP
C103 .001 MF
C104 .01 MF
C107 .001 MF
C110 .01 MF
CR104
C120 10 MF
JU104
A
C1
TO P.A. BD. RELAY
6NP 6NP
NOTES:
1. UNLESS OTHERWISE SPECIFIED: ALL RESISTOR VALUES ARE IN OHMS, 1/4W. ALL CAPACITOR VALUES ARE IN PICOFARADS.
2. ○JU○ DENOTES SOLDERED IN JUMPERS.
3. ——— DENOTES BOARD BOUNDRIES.
LAST USED NOT USED
F101 —
IC101 —
R118 —
C136 —
CR111 —
L110 —
JU104 —
RY101 —
NEXT ASSY BAU-80
USED ON
APPLICATION
DO NOT SCALE DWG
APPROVALS DATE
DRAWN 9-7-79
CHECKED
QUAL. ENG.
PROJ. ENG. 6-80
MFG. ENG.
COMMUNICATIONS INC. SATELLITE BEACH, FLORIDA 32937
SCHEMATIC
SWITCHING BOARD
SIZE D 604-167 REV B
SCALE —
SHEET 1 OF 1


C20
C107
CR104
C110
Q302
Q303
Q301
Q302
C102
C101
C104
R103
C134
C138
L103
L102
R113
C128
R109
C112
L108
R115
C114
L107
R114
C124
C125
C126
C135

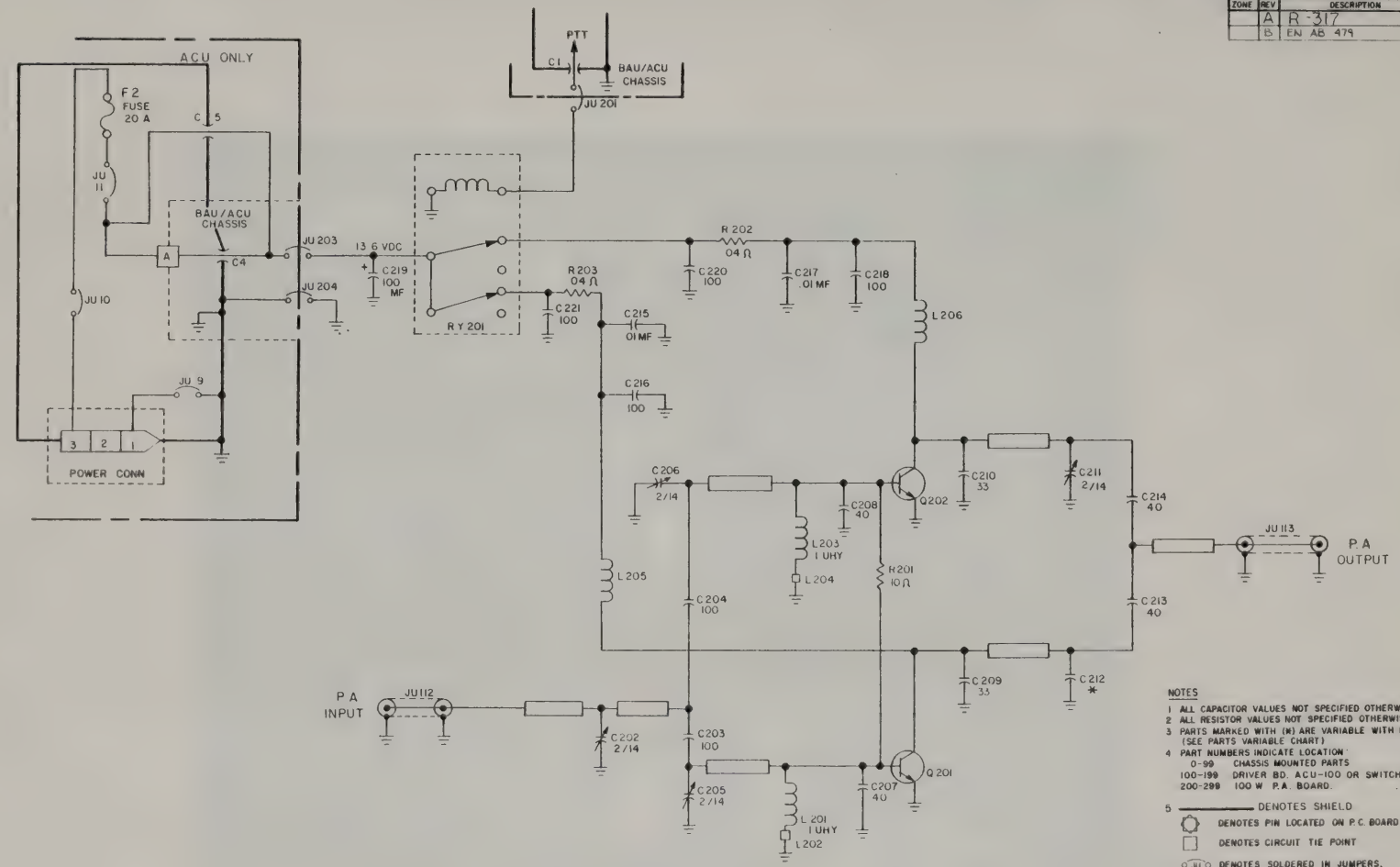
BAU-80



PARTS LIST - BAU8035 SWITCHING BOARD

LOCATION	DESCRIPTION	PART NUMBER
CAPACITORS		
C101	47pF RD 5% NPO	1524-0470-002
C102	47pF RD 5% NPO	1524-0470-002
C103	.001mF CD	1503-0102-001
C104	.01mF CD	1503-0103-007
C105	47pF RD	1524-0470-002
C106	47pF RD	1524-0470-002
C107	.001mF CD	1503-0102-001
C108	47pF RD	1524-0470-002
C109	.01mF CD	1503-0103-007
C110	.01mF CD	1503-0103-007
C111	47pF RD	1524-0470-002
C112	56pF Mica	1522-0560-007
C113	47pF RD	1524-0470-002
C114	47pF RD	1524-0470-002
C115	47pF RD	1524-0470-002
C116	.01mF CD	1503-0103-007
C117	47pF RD	1524-0470-002
C118	47pF RD	1524-0470-002
C119	33pF Mica	1522-0330-006
C120	10mF E U	1513-0100-003
C121	47pF RD	1524-0470-002
C122	220mF E U	1513-0221-002
C123	10pF Mica	1522-0100-006
C124	6.8pF Mica	1522-0689-006
C125	47pF RD	1524-0470-002
C126	56pF Mica	1522-0560-007
C127	.001mF CD	1503-0102-001
C128	.001mF CD	1503-0102-001
C129	47pF RD	1524-0470-002
C130	47pF RD	1524-0470-002
C131	.001mF CD	1503-0102-001
C132	.001mF CD	1503-0102-001
C133	47pF RD	1524-0470-002
C134	56pF Mica	1522-0560-007
C135	56pF Mica	1522-0560-007
C136	47pF RD	1524-0470-002
C137	not used	
C138	47pF RD	1524-0470-002
RESISTORS (All resistors are ¼W 5% unless otherwise noted)		
R101	100K	4704-0104-032
R102	330 ohms comp 10%	4700-0331-042
R103	47 ohms comp 10%	4700-0470-042
R104	2.7K	4704-0272-032
R105	1K	4704-0102-032
R106	47 ohms comp 10%	4700-0470-042
R107	330 ohms comp 10%	4700-0331-042
R108	4.7K	4704-0472-032
R109	330 ohms ½W comp 10%	4700-0331-044
R110	100K	4704-0104-032
R111	150 ohms	4704-0151-032
R112	100 ohms	4704-0101-032

LOCATION	DESCRIPTION	PART NUMBER
R113	180 ohms 1W comp 10%	4700-0181-045
R114	120 ohms 1W comp 10%	4700-0121-045
R115	330 ohms ½W 10%	4700-0331-044
R116	2.7K	4704-0272-032
R117	10K	4704-0103-032
R118	10K	4704-0103-032
COILS		
L101	choke BAH100	1803-3269-400
L102	choke RF .47 uhy	1802-0478-009
L103	choke RF .47 uhy	1802-0478-009
L104	choke RF .47 uhy	1802-0478-009
L105	coil loop RF	1801-3247-401
L106	choke RF .47 uhy	1802-0478-009
L107	choke RF .47 uhy	1802-0478-009
L108	choke RF .47 uhy	1802-0478-009
L109	choke RF .47 uhy	1802-0478-009
L110	choke 1½ turns	1803-5125-907
DIODES		
CR101	diode, MBD 201	4816-3302-200
CR102	diode, MBD 201	4816-3302-200
CR103	diode Zener, 9.1V IN5999BRL	4808-0000-028
CR104	diode, SIL IN5401	4806-0000-013
CR105	diode pin UM9484	4815-3480-600
CR106	diode zener, 9.1V IN5999BRL	4808-0000-028
CR107	diode pin UM9484	4815-3480-600
CR108	diode pin UM9484	4815-3480-600
CR109	diode pin UM9401	4815-3408-601
CR110	diode IN4002	4806-0000-004
CR111	diode Zener, 9.1V IN5999BRL	4809-0000-028
TRANSISTORS		
Q101	transistor, MPS A55	4801-0000-001
Q102	transistor, SPS952	4801-0000-010
Q103	transistor, WT Top	4801-0000-060
MISCELLANEOUS		
IC101	IC MC-1741	3130-3167-907
RY101	relay 12V	4500-3251-900
F101	fuse clip	2100-0000-007
	fuse 20A	5106-0000-022



PARTS VARIABLE *

MODEL	C212		
AASCU100A / ACU 100A / BAU 8035A	15 pF		
AASCU100B / ACU 100B / BAU 8035B	10 pF		

REFERENCE DESIGNATION	
LAST USED	NOT USED
C 220	C201
R 203	
L 206	
RY 201	
JU 11	JU 1-8
C5	C2, C3
JU 203	JU 202

NOTES

1 ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
2 ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, ¼ WATT
3 PARTS MARKED WITH (*) ARE VARIABLE WITH MODEL — (SEE PARTS VARIABLE CHART)
4 PART NUMBERS INDICATE LOCATION:
0-99 CHASSIS MOUNTED PARTS
100-199 DRIVER BD. ACU-100 OR SWITCH BD BAU-8035
200-299 100 W P.A. BOARD.
5 ——— DENOTES SHIELD
DENOTES PIN LOCATED ON P.C. BOARD
DENOTES CIRCUIT TIE POINT
DENOTES SOLDERED IN JUMPERS.
DENOTES HARDWIRE JUMPERS-USER SELECTED
DENOTES PLUGGED IN JUMPERS (OPTIONS)
- - - - - DENOTES BOARD BOUNDARIES
— — — — — DENOTES OPTION VARIATIONS
6 THIS SCHEMATIC IS USED IN CONJUNCTION WITH P.C BOARD 604-149, PARTS PLACEMENT 604-247, ARTWORK 604-148.

DWG NO 604-150 SH 1 REV 3

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	R-317		
	B	EN AB 479 CMPC		

	BAU 8035 A,B AASCU100 A,B ACU100 A,B		APPROVALS	DATE
NEXT ASSY	USED ON			
APPLICATION		DO NOT SCALE DWG		

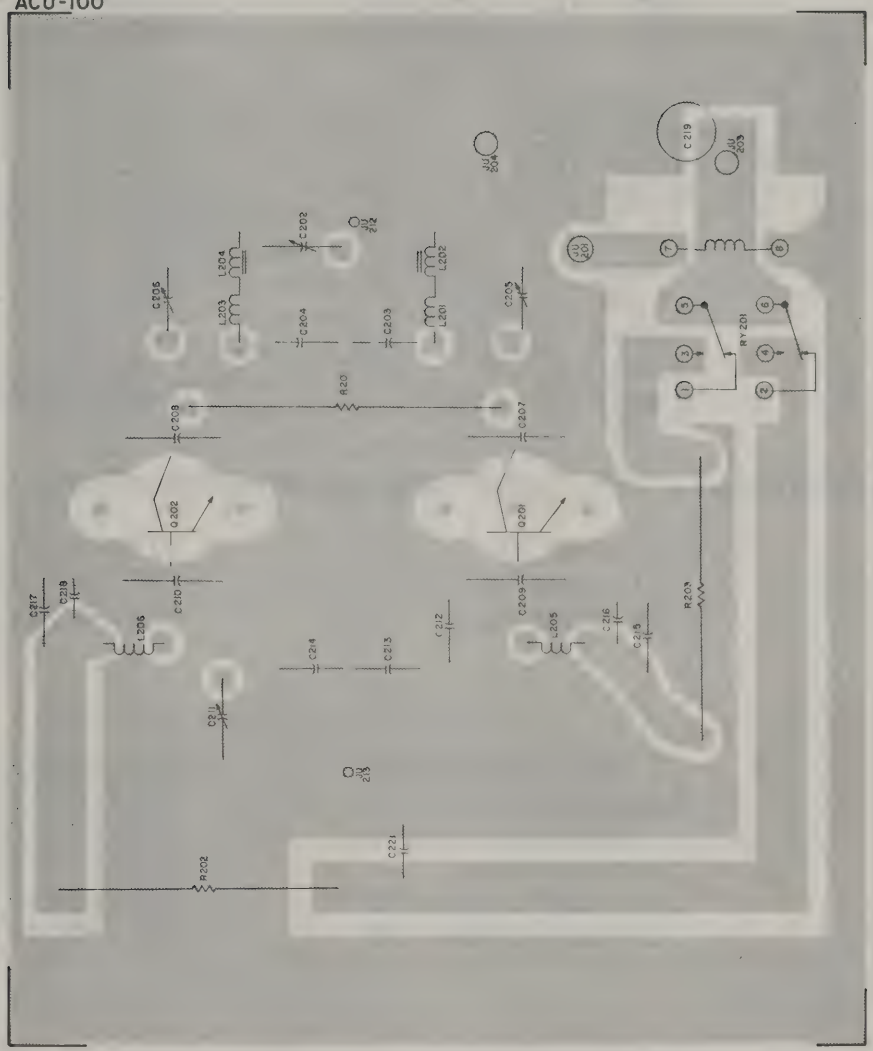
Regency COMMUNICATIONS INC
SATELLITE BEACH, FLORIDA 32937

SCHEMATIC BAU/ACU100 P.A. P.C.

SIZE D PART NUMBER 604 150 REV B
SCALE NONE SHEET 1 OF 1

P.A. BOARD
ACU-100

P. A. BOARD
ACU-100



PARTS LIST - 100W P. A. BOARD

LOCATION	DESCRIPTION	PART NUMBER	
CAPACITORS			
C201	not used		
C202	1.7 - 14pF Trim	1517-0000-045	
C203	100pf Mica	1522-0101-007	
C204	100pF Mica	1522-0101-007	
C205	1.7 - 14pF Trim	1517-0000-045	
C206	1.7 - 14pF Trim	1517-0000-045	
C207	40pF Mica bracket	1522-5418-303	
C208	40pF Mica bracket	1522-5418-303	
C209	33pF Mica bracket	1522-5418-304	
C210	33pF Mica bracket	1522-5418-304	
C211	1.7 - 14pF Trim	1517-0000-045	
C212	15pF Mica	1522-0150-006	Range A
C212	10pF Mica	1522-0100-006	Range B
C213	40pF Mica	1522-0400-006	
C214	40pF Mica	1522-0400-006	
C215	.01mF CD 500V	1503-0103-008	
C216	100pF CD 500V	1500-0101-905	
C217	.01mF CD 500V	1503-0103-008	
C218	100pF CD 500V	1500-0101-905	
C219	100mF E 16V	1513-0101-002	
C220	100pF CD 500V	1500-0101=905	
RESISTORS (All resistors are 10% unless otherwise noted)			
R201	10 ohms 1W	4700-0100-045	
R202	.04 ohms 5W	4707-0048-043	
R203	.04 ohms 5W	4707-0048-043	
COILS			
L201	.1 uhy choke RF	1802-0108-008	
L202	ferrite bead	2502-0000-001	
L203	.1 uhy choke RF	1802-0108-008	
L204	ferrite bead	2502-0000-001	
L205	.15 uhy choke RF	1803-3269-000	
L206	.15 uhy choke RF	1803-3269-000	
TRANSISTORS			
Q201	MRF 648	4804-3269-805	
Q202	MRF 648	4804-3269-805	
RY201	relay 12V	4500-3269-100	

APPLICATION	
NEXT ASSY	USED ON
	BAU8035

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	R-333	3-81	[illegible]
B	AB788	5-81	DaJ

FINAL TEST PROCEDURE BAU 8035

A. Power Amp Alignment

I. Test Set-Up

a. Equipment

1. RF Power Oscillator or Transmitter UHF 35W
2. Thruline Wattmeter & 50W 450-512 MHz Element
3. Thruline Wattmeter & 250W 450-512 MHz Element
4. 200W - 50 ohm - RF Attenuator or Load
5. UHF Notch Filter
6. Spectrum Analyzer
7. DC Power Supply
8. DC Voltmeter 0-20 VDC
9. DC Power Supply 13.6 VDC - 25A
10. Ammeter 0-25 Amp
11. Frequency Counter 450-512 MHz
12. BAU 8035 Power Amplifier
13. Blade Type Tuning Tool

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE FRACT. ± DEC .XX± .XXX± ANG. ±	APPROVALS	DATE
	DRAWN GM	3/3/81
	CHECKED	
	DFTG. SUPV.	
MATERIAL	ENGR. DaJ	3/3/81
FINISH		
DO NOT SCALE DRWG.		

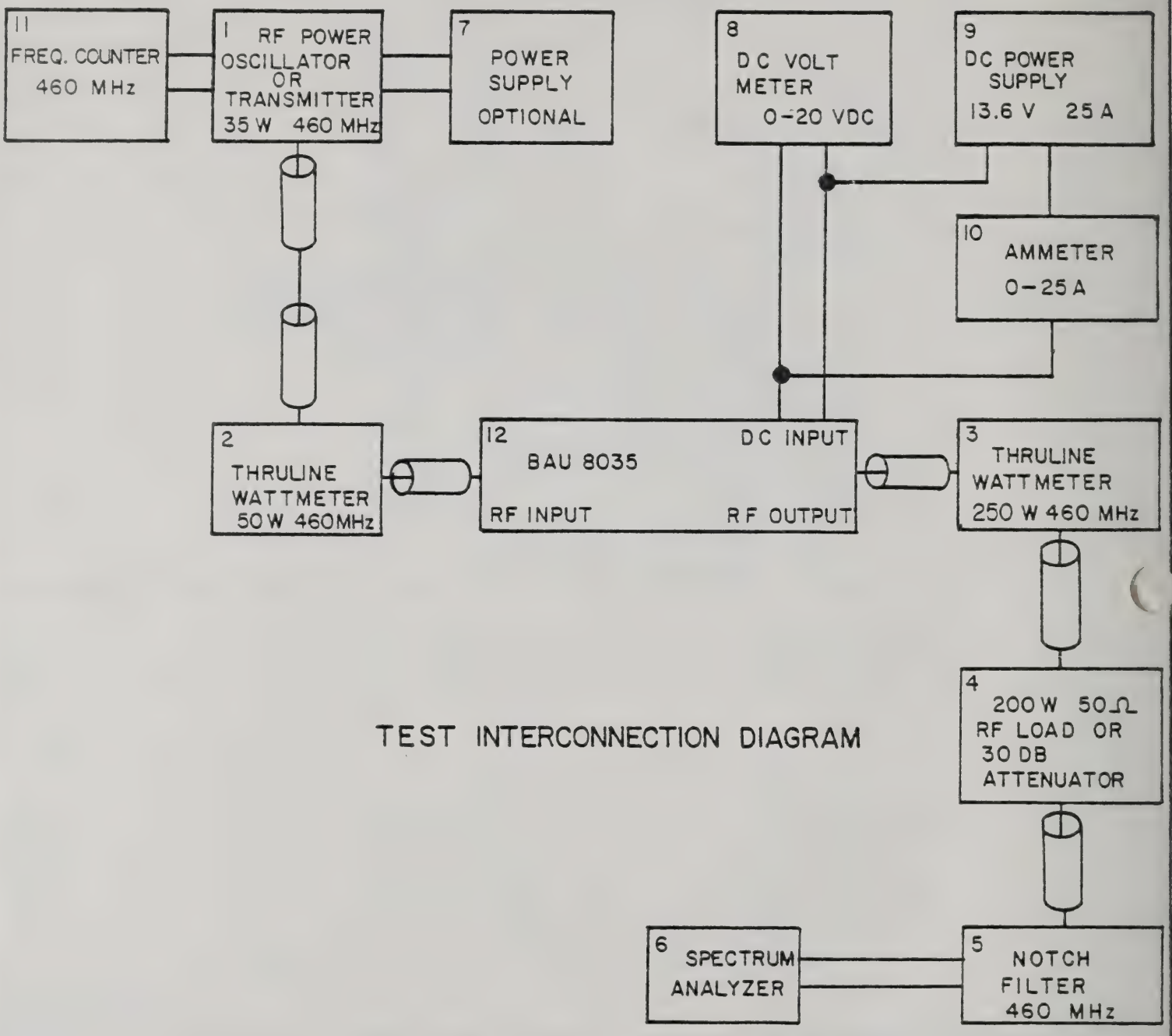
Regency® COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

TEST PROCEDURE - BAU 8035

SIZE	PART NUMBER	REV.
A	TP-14-302	E

SCALE

REV. B | SH. 2 | DWG. NO. TP 14-302



TEST INTERCONNECTION DIAGRAM

DRAWN SJR	DATE 6-80	SIZE A	PART NUMBER TP 14-302	REV. B
APPROVED Daf	DATE 3-4-81			
DO NOT SCALE DWG.		SCALE		SHEET 2

II. Tune-Up Procedure

A. Preliminary

1. Connect the test equipment as shown in the interconnection diagram. Calibrated wattmeters must be used. The RF power source must deliver 35W minimum.
2. Set the DC power supply (9) to deliver 20A at 13.6 $\pm$ 0.2 VDC measured at the DC input.
3. The variable capacitors should be preset as below.

Minimum capacitance	C202, C205, C206
1/4 maximum capacitance	C211

B. RF Pass Test

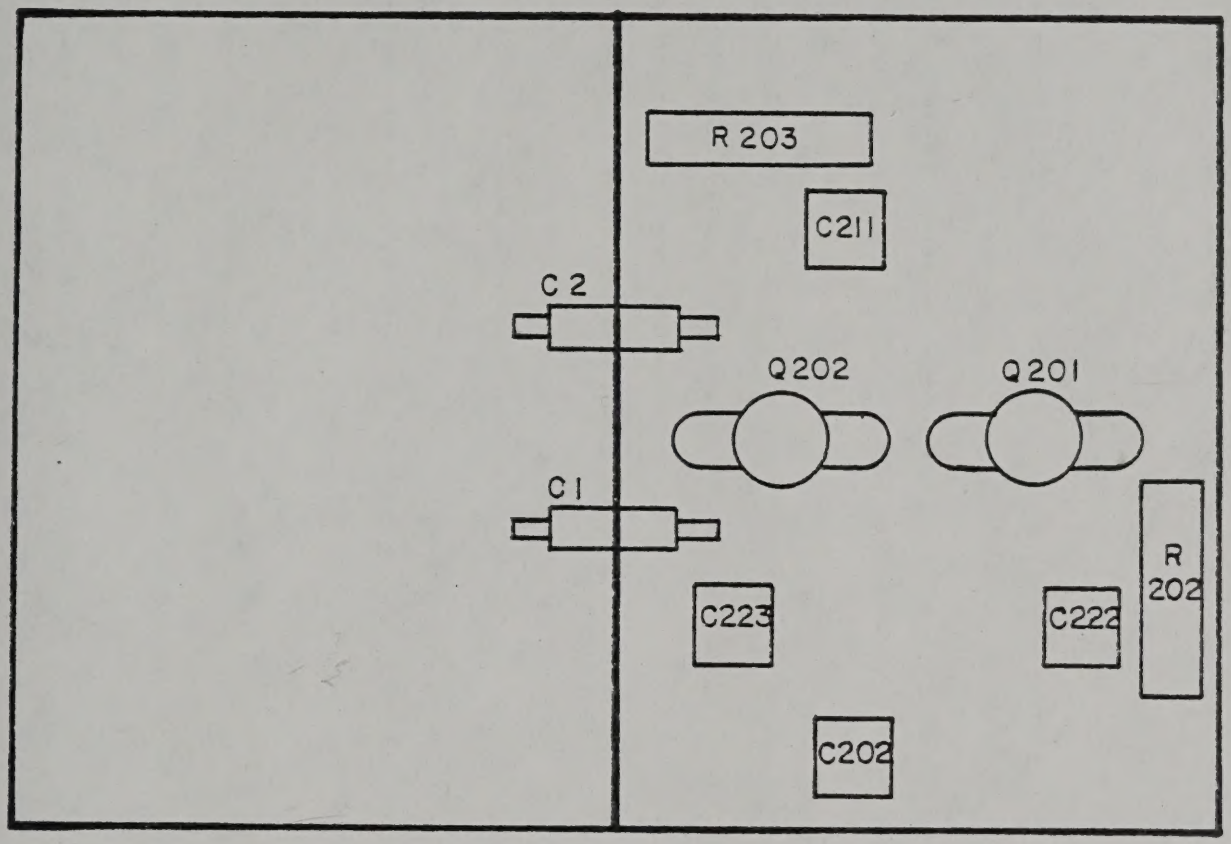
1. Set ON/OFF switch in OFF position. Neither indicator should be on.
2. Set ON/OFF switch in ON position. The green ON/SWR indicator should be on.
3. Set ON/OFF switch in OFF position. Key transmitter. If the input power is 35W the output wattmeter should read not less than 25W (1.5dB insertion loss).

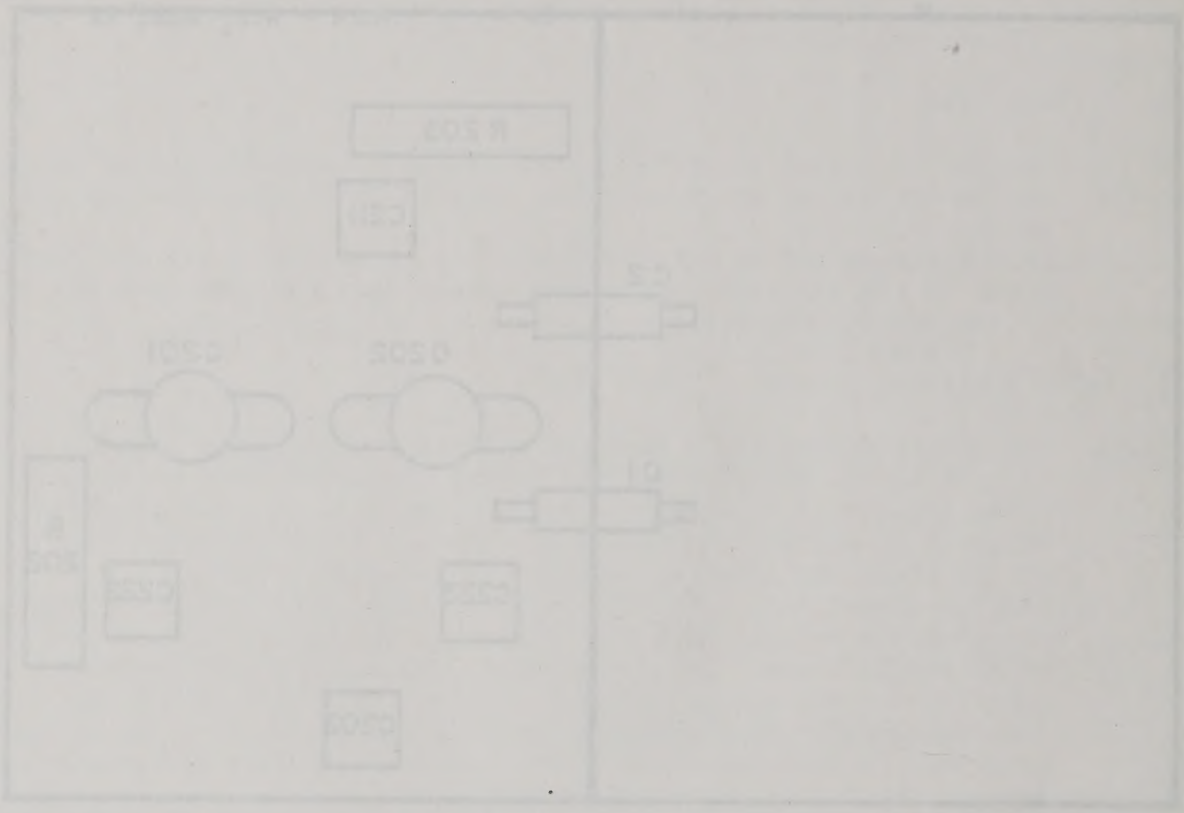
C. Power Amplifier Tune-Up

1. Set ON/OFF switch in ON position. Install jumper from lead of C1 to lead of C2; both are mounted on the chassis. The red transmit indicator should be on also. If the jumper is not installed, when RF power is applied the relays may chatter until the input match on the power amplifier is tuned to an acceptable VSWR.
2. Key the transmitter. Tune C202 for minimum input reflected power which should be less than 2W. Tune C211 for maximum output power which should exceed 100W. Then tune C205 and C206 for maximum output power and retune C202 for minimum input reflected power.
3. Tune C211 toward maximum capacitance until output power is degraded. This step is included to tune the amplifier for best efficiency - least current at a given power output level.
4. Monitor DC voltage across R202 and R203. If the voltage difference exceeds 0.05 VDC tune C205 and C206 such that it does not. This step insures that the current is balanced between the transistors. Turn off the transmitter.
5. Remove jumper; green ON/SWR indicator should be ON. Key transmitter. Amplifier power should exceed 100W and the red transmit indicator should be the only LED on.
6. Harmonics measured on the spectrum analyzer with the notch filter tuned to the carrier must be less than 63dB with the case on.
7. Remove cable from RF output port. Key transmitter. The relays must not switch and the ON/SWR green indicator must remain on. Reattach output cable.
8. Repeat B3.
9. Reduce P_{in} to 27W. Key radio transmitter. The BAU 8035 red TX indicator must light, the relays must not chatter and the BAU 8035 should deliver at least 60W to a 50 ohm load.

III. Table of Performance Limits

PARAMETER	MIN	MAX	UNITS
Input VSWR	0	2	W
Max tune power out when Pin = 35W	80	-	W
Max tune current	-	18	A
Max tune V R202,3	0.2	0.40	V
Difference		0.05	V
RF pass (35W - Pin)	25	-	W



TUNING ADJUSTMENT LOCATION
BAU 8035

DRAWN SJR	DATE 6-80	SIZE A	PART NUMBER TP 14-302	REV. B
APPROVED BAJ	DATE 3-3-81			
DO NOT SCALE DWG.		SCALE		SHEET 5